



German Chamber of Commerce
and Industry in Japan
在日ドイツ商工会議所



German Innovation Award
ドイツ・イノベーション・アワード

Press Release

10th German Innovation Award Ceremony in Tokyo

Tokyo, 26 June 2018 – During a festive award ceremony at the Grand Hyatt Tokyo, awards were presented to the winners of the German Innovation Award - Gottfried Wagener Prize 2018 on Tuesday.

Established by the German Chamber of Commerce and Industry in Japan (AHK Japan) and German high-tech companies with research interests in Japan in 2008, the award's goal is to foster bilateral exchange between business and science and support the development of German-Japanese networks and research cooperation. Every year, promising young Japan-based scientists are awarded for outstanding research contributions. This year's awardees were selected from a total of 84 entries by scientists from 37 Japanese universities and research institutions. There are four research fields, all of which have equal weight: 1) Materials 2) Digitalization & Mobility 3) Energy 4) Life Sciences.

The award-winning research projects are application-oriented and show innovative quality and scientific excellence.

The German Innovation Award is coordinated by AHK Japan under the patronage of Federal Minister for Education and Research Anja Karliczek. German scientist and co-founder of Tokyo Institute of Technology Gottfried Wagener (who made substantial contribution towards the development of the education landscape during the Meiji era) gave the award its name.

German Innovation Award – Gottfried Wagener Prize 2018 Awardees

Research field: Materials

Prof. Dr. Takashi Kimura; Professor, Department of Physics, Kyushu University
“Development of wireless spintronic device based on thermal spin injection”

Research field: Digitalization & Mobility

Prof. Dr. Naofumi Homma; Professor, Research Institute of Electrical Communication, Tohoku University
“Design Methodology for Lightweight Tamper-Resistant Cryptographic Hardware”

Research field: Energy

Prof. Dr. Masahiro Nomura; Associate Professor, Institute of Industrial Science, The University of Tokyo
“Thermal conduction control by phonon engineering and thermoelectric energy harvesting application”

Research field: Life Sciences

Prof. Dr. Makoto Ikeya; Associate Professor, Center for iPS Cell Research and Application, Kyoto University
“Drug discovery research for fibrodysplasia ossificans progressiva by using patient-specific iPS cells”

Contact

German Innovation Award PR Secretariat (Kyodo PR)
PR agent : Tatsuya Tsuzuki, Ariyoshi Komatsu
Dowa Building, Ginza, 7-2-22, Chuo-ku, Tokyo 104-8158
03-3571-5228

giaward-pr@kyodo-pr.co.jp

www.german-innovation-award.jp

Overview of the awardees work

<Materials>

Prof. Dr. Takashi Kimura; Professor, Department of Physics, Kyushu University

“Development of wireless spintronic device based on thermal spin injection”

Electrons possess not only charge, which describes the electric property, but also spin, which behaves as a small magnet. Since the direction of the spin (upward or downward) can be used for data storage and communication signals, spintronics, which is the electronics based on spin, is a promising next-generation technology that extends the boundaries of semiconductor integration in electronics. Physicist Takashi Kimura has achieved various innovative demonstration for generation and manipulation of pure spin current that is an electron flow only carrying spin.

It was believed that generating a pure spin current requires a charge current in general. Therefore, the energy loss and device damage due to the heating resulting from electrical resistance were serious issue. Professor Kimura has succeeded in generating pure spin current in an extremely efficient manner, simply by heating a ferromagnetic CoFeAl alloy without the application of an electric current. He also demonstrated that a ferromagnetic body can be selectively heated by exciting the ferromagnetic resonance under the microwave irradiation with a specific frequency, Merging these two technologies, an innovative thermal spin injection was achieved without the need for wires.

In this manner, Professor Kimura opened the way to energy-saving spin devices that can reduce the need for wasteful electric wiring and even operate without wires. Potentially, this is a powerful technology for future use in fields such as medicine and crime prevention. Another application that can be considered is energy harvesting, where it can be used to convert minute amounts of environmental heat and microwave to electricity, which will have a major impact on society.

Professor Kimura is engaged in more effective design of ferromagnetic materials, based on quantum-mechanical simulation, and continues to explore high-performance alloys that can more efficiently generate pure spin current through heat. Based on his series of studies, the creation of novel devices that make utmost use of the potential of electron spin is anticipated.

<Digitalization & Mobility>

Prof. Dr. Naofumi Homma; Professor, Research Institute of Electrical Communication, Tohoku University

“Design Methodology for Lightweight Tamper-Resistant Cryptographic Hardware”

The IoT, a network of digitally enabled devices connected over the Internet, has made rapid progress via attempts to digitally enrich society. In contrast, this has also facilitated a wide range of attacks, putting us increasingly at risk of new threats.

However, simply expanding existing technology may not be enough to ensure future information security. Professor Naofumi Homma, an information scientist, has promoted innovation in information hardware security technology, with the goal of building systems that allow information communication technologies to be safely used even in advanced information societies.

Professor Homma and his team have developed design technology for cryptographic hardware to serve as a platform to safely connect a wide range of terminals to an information-dense cyberspace environment. They have also built foundational technology to detect physical attacks against computer systems including cryptographic ones, in order to prevent penetration of the internal structures of computer systems.

The above technologies reduce energy consumption of cryptographic operation by at least 50% and are capable of instantly detecting a wide range of physical attacks (including attacks that were previously difficult to prevent) with around 1/100th the amount of overhead compared with conventional methods. Their design technology can be used for many current and next-generation cryptography systems. Their attack-detection technology can be used on all routes in which physical attacks could occur.

Professor Homma is now working with universities, companies, and government organizations inside and outside Japan to implement them throughout society and standardize their findings. He aims to establish new security design and evaluation technologies capable of integrating everything from hardware algorithms to usage environments.

<Energy>

Prof. Dr. Masahiro Nomura; Associate Professor, Institute of Industrial Science, The University of Tokyo
“Thermal conduction control by phonon engineering and thermoelectric energy harvesting application”

Since heat dissipation is a problem in many optical and electrical devices, thermal conduction is a common facet of everyday life. The phenomenon of thermal conduction can be explained in terms of the vibrating lattices that carry heat as quasi particles called phonons. The ability to control phonons, which have wave-like properties, within solids has opened up the new field of phonon engineering (heat transfer engineering). The physicist Masahiro Nomura is engaged in efforts to control thermal conduction through this method.

By creating periodic, circular, nanometer-size holes in a thin silicon film through nano-processing, Associate Professor Nomura and his associates have produced heat flow in a specific direction and have realized the heat focusing at a single point within a solid for the first time. By doing so, they have overturned the commonly accepted notion that heat diffuses in all directions. They have also demonstrated that control of thermal conduction based on wave property is possible by altering the periodic properties of these artificial crystal structures, which are called phononic crystals.

This pioneering experiment has shown that advanced thermal control can be accomplished through the design of nanostructures. Furthermore, through joint research conducted with Professor O. Paul's group in the University of Freiburg in Germany, Associate Professor Nomura and his associates have greatly enhanced the thermoelectric conversion capabilities of silicon-based materials by applying multi-scale structures to thermal phonons distributed over a wide range of frequency levels.

These results not only contribute to the resolution of heat dissipation issues for semiconductor chips and other materials, but are also important for the creation of innovative technologies in the field of energy harvesting (environmental power generation) through thermoelectric conversion. As the pioneer of a new field, Associate Professor Nomura envisions using the wave properties of heat and “treating heat like light” as “one of the important themes for scientific and energy problems in the 21st century.”

<Life Sciences>

Prof. Dr. Makoto Ikeya; Associate Professor, Center for iPS Cell Research and Application, Kyoto University
“Drug discovery research for fibrodysplasia ossificans progressiva by using patient-specific iPS cells”

There is steady progress in applications of induced pluripotent stem (iPS) cells developed by Professor Shinya Yamanaka at Kyoto University in 2006. These applications can be broadly classified into two fields: regenerative medicine and drug discovery/pathogenesis. Developmental biologist and stem cell biologist Makoto Ikeya is a pioneer in drug discovery/pathogenesis using iPS cells.

Ikeya's team produced iPS cells from fibrodysplasia ossificans progressiva (FOP) patients. When cells were induced to differentiate, disease symptoms were observed. These cells were transplanted into mice to confirm the success of the FOP model; observation of ectopic bone in muscle tissues. These iPS-derived cultured cells were then exposed to approximately 6800 compounds in order to identify preventing drug candidates. Finally a commercially available drug rapamycin was revealed to be a potential FOP inhibitor. This was the world's first example of iPS cell technology being successfully used as a platform for drug discovery.

Since rapamycin is already used in Japan to treat other diseases, the side effects, safety considerations, and pharmacokinetics of the drug are already known. Therefore, clinical application for FOP is much easier as compared with that for a new compound. Based on these results, a team led by the collaborator, Professor Junya Toguchida at Kyoto University initiated a physician-led clinical trial that administered rapamycin to 20 FOP patients in September 2017. This clinical trial was widely reported by the media, and has gained the attention of the general public.

There are approximately 80 FOP patients in Japan. In the case of rare diseases such as FOP, drug discovery is difficult, and medicines for treating such conditions are not thoroughly developed. Studies by Associate Professor Makoto Ikeya have shone light on the mechanisms underlying this intractable bone and cartilage disease, and have given hope to those suffering from FOP.

Information of the German Innovation Award “Gottfried Wagener Prize 2018”

Eligibility	Applicants must be affiliated to a research institute or university in Japan and be under 46 years of age.
Fields of Research	The prize is awarded for application-oriented research work in the areas of “ Materials ”, “ Digitalization & Mobility ”, “ Energy ” as well as “ Life Sciences. ”
Prize Selection	In each of the four research areas a price of 2,500,000 Yen is awarded. Following a round of pre-selection by technical experts of the partner companies, a jury composed of permanent and expert members will evaluate and select the awardees.
Jury	Permanent Members: Prof. Dr. Masuo Aizawa (Chairman) <i>Counselor to the President, Japan Science and Technology Agency</i> <i>Professor Emeritus and Former President, Tokyo Institute of Technology</i> Prof. Dr. Akira Fujishima <i>Distinguished Professor, Former President, Tokyo University of Science</i> Prof. Dr. Makoto Gonokami <i>President, The University of Tokyo</i> Prof. Dr. Teruo Kishi <i>Professor Emeritus, The University of Tokyo</i> Prof. Dr. Juichi Yamagiwa <i>President, Kyoto University</i>
Organizers	German Chamber of Commerce and Industry in Japan
Partner Companies	BASF Japan Ltd., Bayer Holding Ltd., Bosch Corporation, Continental Japan, Daimler, Evonik Japan Co., Ltd., Merck Ltd., Schaeffler Japan Co. Ltd., Siemens Group in Japan
Co-Partners	German Centre for Research and Innovation Tokyo (DWIH Tokyo)
Support	Embassy of the Federal Republic Germany, Federal Ministry of Education and Research, German Academic Exchange Service (DAAD), German Research Foundation (DFG), Fraunhofer-Gesellschaft, Japan Science and Technology Agency, Japan Society for the Promotion of Science

Contact

German Innovation Award PR Secretariat (Kyodo PR)
PR agent : Tatsuya Tsuzuki, Ariyoshi Komatsu
Dowa Building, Ginza, 7-2-22, Chuo-ku, Tokyo 104-8158
03-3571-5228

giaward-pr@kyodo-pr.co.jp

www.german-innovation-award.jp